Designing an Interactive Residential Play Space - An Alternative to Smart Gadgets

By

Suhanya.S

(19PHRMF001)

Supervisor

Dr.R.Jeyagowri

Department of Resource Management

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I. Introduction

Children are the living embodiment of our future world. The destiny of humanity rests upon the shoulders of the younger generation. By nurturing and teaching children during their early years, families play an important role in making sure children are ready to learn when they enter school. At present, a rise in the nuclear family among young couples and simultaneously single child family system is on the rise. India's National Family Health Survey-4 showed that only 24 per cent of married women (between 15 years and 49 years) and 27 per cent of men want a second child (Dhirar et al., 2018). Due to the increase in the standard of living of Indian families, taking up gainful employment by both the parents is increasing.

Children use smart gadgets maximum in a day even when the grandparents and caretakers (paid help) are around, they found it easy to handle children when children are with smart gadgets. Smart gadgets have become ingrained in the lives of children. The use of smart gadgets has several negative consequences, one of the major reasons is being the reduction in time spent in physical play and also playing with their peers is reduced (Feng, 2022). Physical Play contributes towards physical, cognitive, social, emotional and language development (Pollarolo et al., 2023). So developing an Interactive Play Space within the residence is essential in order to promote the physical play and to reduce the use of smart gadgets. The Oxford Dictionary (2022) states that the term interaction is reciprocal action or influence of persons or things on each other (Lea and Bradbery,2022). In this study, the term interactive was framed as the developed play equipment that will communicate with the children verbally or non-verbally through play and be able to teach children essential skills.

Unfortunately, situations such as an increase in nuclear family setup, both-parents working culture and lack of time for children have prevented the parents from spending time with the children and they compensate for these drawbacks by providing smart gadgets to them. This situation can be overcome if households limit the use of smart gadgets for academic and other essential purposes alone and provide them with an effective play environment at home. This piqued the investigator's interest in pursuing the study on "**Designing an Interactive Residential Play Space- An Alternative to Smart Gadgets".**

Statement of the Problem

It is important to bring children out from the virtual world to real world with the help of physical play. However, various factors such as working parents, aged caretakers, child safety and lack of persons to accompany children for outdoor play are the barriers that pave

way for children to use smart gadgets all the time. Developing the play space within the residences based on the space availability will be a great alternative to smart gadgets.

Need for the Study

Commercial play zone located at the main areas of the city are very expensive. Spending lot of time, money and finding a caretaker to accompany children to commercial or corporation parks by the households are difficult on daily basis.It is ideal to plan and allocate a play space within the residence, so that the children can play at any time whenever they are interested

Objectives

- Elicit information on the daily activities of parents, behavioural pattern of children and use of smart gadgets in their residences
- Examine the Prospects and constraints of using smart gadgets by children
- Assess the needs and preferences of parents and children in designing interactive play space for children in their residences
- Develop design for the fabrication of an interactive play space suitable for children
- Conduct awareness programme for the parents on the developed interactive play space design and its use
- Implement the designed Interactive Play Space in the selected residences and evaluate the user acceptance

Scope of Research Work

The developed Interactive Residential Play Space helps children to improve their skills and facilitates the learning of new concepts through a play way method. The ill effects of smart gadgets on children get reduced by using the developed Interactive Residential Play Space continuously and this play space will definitely be an alternative in reducing the harmful effects of smart gadgets.

Hypotheses:

The following hypotheses are set to analyze the research problems through appropriate methods:

$H_0$1. There is no significant difference in indoor and outdoor play practices among selected children aged 2–5 years based on age, gender and between age and gender

$H_0$1. (a) There is no significant difference in indoor play practices between the age of children

$H_0$1. (b) There is no significant difference in outdoor play practices between the age of children

$H_0$1. (c) There is no significant difference in indoor play practices between the gender of children

$H_0$1. (d) There is no significant difference in outdoor play practices between the gender of children

$H_0$1. (e) There is no significant difference in indoor play practices between the age and gender of children

$H_0$1. (f) There is no significant difference in outdoor play practices between the age and gender of children

Ha2. The effect of children's age and gender, parental age, education, occupation and smart phone time usage significantly influence smartphone time usage of children

H_a2. (a) Age , gender, between age and gender of children significantly influence their time spent on smartphone

H_a2. (b) Parental age, education and occupational status significantly influence children's time spent on smartphone

H_a2. (c) Time spent by parents on smartphone significantly influence children's time spent on smartphone.

Ha3. The effect of children's age and gender, parental age, education, occupation and screen time (TV) significantly influence screen time (TV) of children

H_a3. (a) Age , gender, between age and gender of children significantly influence their screen time (TV)

H_a3. (b) Parental age, education and occupational status significantly influence children's screen time (TV)

H_a3. (c) Parental screen time (TV) significantly influence children's screen time (TV)

Ha4. There is a significant difference in the impact of smart gadgets on children based on age and gender.

Ha4. (a) There is a significant difference in the impact of smart gadgets on children based on age

Ha4. (b) There is a significant difference in the impact of smart gadgets on children based on gender

Ha4. (c) There is a significant difference in the impact of smart gadgets on children between the age and gender of children

H_a5. There is a significant increase in the parental awareness on the impact of smart gadgets, the effect of physical play and the importance of Interactive Residential Play Space after the awareness programme

H_a5. (a) There is a significant increase in parental awareness on the impact of smart gadgets after the awareness programme

H_a5. (b) There is a significant increase in parental awareness on the effect of physical play after the awareness programme

H_a5. (c) There is a significant increase in parental awareness on the importance of Interactive Residential Play Space after the awareness programme.

II. Review of Literature

Child development is a process of physical and mental changes with time. It covers all the periods from which a child becomes a fully functioning adult. The development of intellectual growth of a child involves social, emotional, and language development. Play is a critical and defining feature of childhood, particularly early childhood. Early childhood educators, philosophers, and researchers have for centuries recognized the important role that play has in the development and growth of children. Play is an innate need and biological behaviour not just of children, but of all humans and animals. Just as humans have a biological need to sleep and eat for health and well-being, we also have a biological urge to play (Fong and Peralta, 2018). But nowadays, children are not going out for paly but playing with smart gadgets. Mobile phone and television play an important role on children. In a research, the leading child rights organization, National Commission for Protection of Child Rights (2023) found that only 10 per cent of children enjoy using their smartphones for online learning and education, while 59.2 per cent of children use them for instant messaging apps. Therefore, it is important to bring the children out from virtual world to real world with the help of physical play.

Several indoor interactive residential play spaces have already been developed for children. Bobick et al., (1999) designed a perception-based interactive and immersive storytelling environment that merges the mystery and enchantment of children stories and theatre with the spontaneity and collaborative nature of real-world physical play. Shirai et al., (2002) created Penguin Hockey an interactive indoor play environment. It is a sample of the "Tangible Playroom" material for children. Penguin Hockey is a basic 3D hockey game in which children can play with AI (Artificial Intelligent) penguins. The game allows players to interact with computer-generated items as well as their friends. Penguin Hockey play space is intended for elementary school-aged youngsters aged 6 to 12 years.

Wolf (2013) established the Jungle Gym Playroom at a hospital for children 4 to 12 years. The space is loaded with a variety of physical equipment, with the primary objective of encouraging youngsters to participate in physical exercise. Gelsomini et al., (2019) designed Magika, a multisensory environment and it integrates digital worlds projected on the wall and floor. There are more interactive play spaces developed in many malls, especially for children

by Stellar Children's Museum (2012) Noida, Kaboom (2019) Pune, Children's Discovery Museum (2001) Bangkok and Caterpillar Lane Playground (2017) Sydney.

III. Methodology

The methodology pertaining to the research study entitled "**Designing an Interactive Residential Play Space-An Alternative to Smart Gadgets"** comprised of five major phases:

A. General Profile of Households and Use of Smart Gadgets by Parents and Children

The general information of households and use of smart gadgets by the children were assessed through household survey. This research was conducted in Avadi, a Chennai suburb in Thiruvallur district of Tamil Nadu. Avadi was selected by the investigator based on the following criteria such as Investigator's residential area, availability of the required number of children in the particular age group, feasibility and easy approachability of the sample for the investigator. Purposive sampling method was adopted to identify the 304 samples from the area 'Avadi'. The households with children between the age of 2 and 5 years were only selected. Out of the chosen 304 children, gender selection was on equal basis with 152 boys and 152 girls. The main tool selected for gathering information from households for the study is the interview schedule, where a set of questions were prepared, and each question was posed to the mother and the answers were recorded. Face-to-face personal interviews were conducted in the selected households to get information such as socio economic profile of the households, daily activity pattern of the children, role of play on children and role of smart gadgets on parents and children.

B. Developing a Prototype Design and Fabrication of an Interactive Residential Play Space

Determining the space availability and parental choices of design for interactive play space**,** only 169 from 304 households positively accepted to install the interactive play space in their residences. Among the 169 households, 38 households with 2 year old, 36 with 3 year old, 51 with 4 year old and 44 with 5 year old children were selected by convenient sampling method. The interview method was adopted to gather information on the availability of play space in their residences, purpose of the children room, problems faced in maintaining play space, preferences of the households in designing play space for their children. These information were gathered through interview cum observation method. Flash card method was also adopted by the investigator for the parents to choose the play equipment in the residential

play space. The investigator conducted interview for the selected 169 households by personally visiting their residences by following WHO (2021) COVID 19 guidelines.

After analysing the space availability and parental preferences in designing the interactive residential play space, Totally 23 play equipment were chosen for designing Interactive Residential Play Space out of which only 10 equipment were purchased and customised and the remaining 13 were newly designed and fabricated based on the age of children. Among 23 each six equipment were chosen for each age group (2-3, 3-4 and 4-5 years) and five common equipment for all three age groups.

- The play equipment chosen for 2-3 year old children were musical wall, ball pit area, ball maze wall, colour wheel , 1 piece puzzle and sand pit
- The play equipment chosen for 3-4 year old children were colour organizer, self-adjustable ball tracker, tracing wall, lacing beads, 5-10 pieces puzzle and pulley
- The play equipment chosen for 4-5 year old children were climbing wall (7 feet height), magnetic puzzle bead maze wall, memory card play, count and match wheel, puzzle wall(40 pieces), and water play .
- The five play equipment chosen in common for all age groups were scribbling board, interactive wall, pretend play mat (6 different theme), basketball, and writing mat.

For developing the play equipment, various materials were analysed, out of which wood, plastic, foam and metal were selected for designing the interactive play equipment as they were found to be more suitable and eco-friendly than the other materials. The standards such as IAP (2020), WHO (2020), Government of India, Ministry of Women & Child Development (2018) were chosen for physical and environmental standards. Three designs for three different interactive play space for three age groups were developed with the help of computer aided software such as AutoCAD and 3ds Max. The prototype model design was fabricated in the investigator's residence. The developed interactive play equipment which were fabricated in the allotted play space and were assessed with 30 experts of each five general physicians, child specialists (paediatrician), preschool teachers, child psychiatrists, interior designers and parents with 2-5 year old children. They were invited to the investigator's residence to touch and feel each developed play equipment and assessed with 16 parameters such as age appropriate, child friendly colours, user friendly, game efficiency, educational value, promotes creativity, improves logical thinking, enhances fine and gross motor skills, aesthetic, no sharp edges, no

small parts, ease in installation, easy maintenance, child safety materials, cost effective and fixed at an appropriate height. The validity of the Likert scale results assessed with CVI (Content Validity Index) shows the acceptance of each play equipment. After assessment, sand pit, pulley, water play and writing mat were not accepted by the experts, the remaining 19 play equipment have been accepted after few modifications and installed in three different rooms of the investigator's residence based on the age groups (2-3, 3-4 and 4-5 years).

C. Creating an Awareness among Parents and Evaluating the Effective Acceptance of Interactive Residential Play Space

An awareness on the impact of smart gadgets, importance of play and knowledge on the developed interactive play space were given to the 50 parents (50 mothers and 50 fathers). They were requested to bring their child along with them so the child can also play with the developed play equipment in the play space. The awareness programme was conducted for 5 days (three Saturdays and two Sundays). Two sessions each day, morning (10 am to 12 pm) and evening (4pm to 6 pm) with 2 hours for each session i.e., 4 hours per day. Thus, totally 20 hours of contact classes were conducted for creating an awareness for 50 parents. The methods adopted for awareness were lecture, group discussion and model demonstration. Further, the developed play spaces were evaluated by 50 parents.

D. Installation of the Developed Prototype Play Space Design in the Selected Households

After incorporating all the suggestions given by the parents and from the observation of children playing in the play space, the investigator prepared a final prototype play space design and this design was executed in the selected six households by purposive sampling method. The criteria for the selection of six households were:

- Households with single child only have shown lot of interest and enthusiasm after pre-trial exposure of model Interactive Play Space during awareness programme and at the end of the awareness generation programme on their own expressed their willingness to install one in their residence
- Among the selected six households having single child, from each age group one girl from one family and one boy from another family were chosen
- Households who were willing to bear the expenses for the installation of play space

The steps involved in this stage was Selection of room, Identifying the dimension, Preparing the 2D & 3D views, Getting acceptance of the design from the family members, Fabrication of interactive play equipment, Installation of interactive play equipment in play space with the help of a carpenter.

E. Evaluating Six Case Studies on the Impact of Interactive Play Space on Children

A detail observation of children using an interactive play space is essential to understand the child behaviour and the prospects of interactive residential play space. Therefore, case study method was adopted. A check list was prepared for recording the daily activities of the children in theirhouseholds and was handed over to the child's caretaker. This check list included the list of various play equipment installed in the room (residential play space) and the caretaker must fill up data such as the time spent by the child on each play and the total time the child has spent in the interactive play space per day. The investigator requested the caretaker to record the daily activities of children for minimum 2 hours for 63 days. The minimum two hours need not be at a stretch and children can play depending upon their interest to play. The study was conducted during the period of 1st December 2021 – 1st February 2022.

IV. Major Findings of the Study

A. Socio Economic Profile of Selected Households

The socio economic profile of the families consists of background information and general profile such as family size, type, religion, mode of housing, type of accommodation and monthly income of the selected family members. It also includes the details such as age, educational status and occupational status of the parents and grandparents of the children. Highest percentage of the selected children were staying in a nuclear family (59.2 per cent) with three family members (36.8 per cent) and followed Hinduism (52.6 per cent) as their religion. A majority of 59.2 per cent of the children inhabited in their own houses and the type of accommodation was apartment (46.7 per cent). A majority of 35.5 per cent of the surveyed households' monthly income was Rs.75001 to Rs1,00,000

- **Educational Status of Selected Children, a** majority of 73.7 per cent of girls and 65.8 per cent of boys were not going to school at the age of two. At the age of three, 57.9 per cent of girls and 36.8 per cent of boys were in Pre KG. Each, 81.6 per cent of boys and girls were studying LKG at the age of four and a higher percentage of five year old girls (92.1 per cent) and boys (86.8 per cent) were studying UKG.

B. Daily Activity Pattern of Selected Children

- In general, the results show that the activity pattern of the two year old children was different from that of the children above three years. The two year old non-school goers were allowed to play, engaged by the family members or allowed to spend time on smart gadgets at home.
- About 23 per cent of the 2-5 year old children enjoy outdoor play by either going to a park or public ground, whereas the remaining 77 per cent of the children spend time inside their residences by watching TV or by playing in mobile phones or other smart gadgets after the school hours.
- Eighty nine per cent of children were spending one to one and half hours between 5 pm and 9pm for studying.
- Among the 304 children, 210 (69.1 per cent) played inside their houses as their parents or caretaker did not allow them to go out and only 94 children (30.9 per cent) enjoyed outdoor play activities. It is observed that the percentage of children playing outdoors decreased with the increase of age.
- On the other hand, the percentage increased with an increase of age for the children engaging in indoor play.
- The various reasons stated by the parents for not letting their children enjoy outdoor play were fear of children getting infection (100 per cent), lack of time (98.7 per cent), traffic (95.1 per cent), child abduction (94.7 per cent) and tiredness of parents (87.8 per cent).
- All the children indulged in an independent play through self-play or with the support of playing aids such as car, doll, ball, etc., and the average time they spent on it was 2 hours 30 minutes.
- A majority of 98 per cent of mothers were taking part in children's play activity followed by 51.3 per cent of fathers.
- A majority of 98 per cent of mothers ((99 per cent with boys and 97 per cent with girls) were engaged in physical play with their children.
- During the daytime, the mothers spent on an average of 4hrs 31min with the children.

C. Implications of Smart Gadgets on Children

- Television and mobile were the most commonly used smart gadgets by the children. A majority of 80.9 per cent of children watched television at home which is more

than the average percentage of the parents watching television (77.6 per cent of mothers and 71.7 per cent of fathers).

- Also, children of all age groups were exposed to television equally. This is probably because, 3–4 year old children spent more time at home with less school based assignments and had more leisure time than five year old children.
- The children spent 3hrs 36min per day watching television. Five reasons the children used television were watching cartoons (85.2 per cent), watching serials (69.1 per cent), listening to movie songs (53.9 per cent), watching movies (47 per cent) and for gaining knowledge (25 per cent).
- The survey showed that more boy children (76.3 per cent) were using smartphones than girl children (68.4 per cent). Five year old children (84.2 per cent) were highly exposed to mobile phones while the two year old children were least (55.3 per cent of boys and 57.9 per cent of girls) exposed. They were spending 2hrs 37min per day with smartphone. Children were influenced to use smart phones by the members of their own families, i.e., father (86 per cent) and mother (83 per cent) taking the top two spots.
- Further, 30 per cent (19.1 per cent of boys and 11.5 per cent of girls) of the children had their own smartphone.
- It was noticed that children used smartphones for listening to rhymes (72.4 per cent), watching cartoons (69.4 per cent), watching educational videos (69.1 per cent) and playing games (58.9 per cent).
- The various impacts of smart gadgets on children were identified and they include cry for phones while eating(80.5 per cent), cry while restrict the use of mobile phone(77.1 per cent), sleep late(55.3 per cent), difficulty in sitting and studying(51.5 per cent), headaches(44.1 per cent), eye issue(40.6 per cent) and finger pain(36.1 per cent). There was no significant difference and interaction observed in the impact of smart gadgets on children with respect to age and sex.

D. Developing a Prototype Design and Fabrication of Interactive Residential Play Space for Children

A prototype interactive residential play space design was developed by the investigator for the households to understand the concept of interactive play space. A majority of 64.8 per cent of the households accepted the designed prototype model. Even though 64. 8 per cent of the households accepted the prototype design, households living in rented houses had expressed

their difficulties to install the play space, because of getting permission from their respective house-owners was considered as an obstacle for the installation. So finally, 55.6 per cent (169 household) had shown very much interest to know more about the Interactive Residential Play Space.

- Only 16 per cent (27 households) of them have provided a separate play space for children in their residences which is in a ratio of 1:5.
- Out of that, 62 per cent, 31 per cent and 7 per cent of them were having rooms with area ranges of less than 100 Sq. Ft, 101 – 150 Sq. Ft and more than 150 Sq. Ft respectively.
- A majority of 88.9 per cent of the households have been using their child's room for storing household stuff, followed by 70.4 per cent of them using it for play purpose just without any proper play space arrangements and 66.7 per cent of them for storing the children's toys.
- Major problems faced by the households in maintaining the children's room which were lack of storage space for toys used for playing (97.4 per cent), small room size (96.1 per cent), messy room with things around (86 per cent), lack of time for cleaning (82.5 per cent) and purchasing of play equipment excessively (65.2 per cent).
- The households preferred factors for designing Interactive Residential Play Space were play space should occupy less space (98.2 per cent), budget friendly (95.8 per cent), easy maintenance (95.3 per cent), made of child friendly materials (92.4 per cent), safety features (83.6 per cent) and beauty (79.3 per cent) for designing the play space.
- All the selected households preferred educational toys for their children followed by creative toys (99 per cent), spinning toys (73.6 per cent), construction toys (63.5 per cent), sound toys (62.9 per cent), electronic toys (45.2 per cent) and dolls (40.1 per cent).
- Spinning toys (98 per cent), sound toys (97.3 per cent), construction toys (89 per cent), electronic toys (89 per cent), creative toys (78 per cent), dolls (8 per cent) and educational toys (45 per cent) were preferred by children.
- The various factors considered by the investigator in designing the Interactive Play Equipment were they should occupy less space, durability, easy to maintain, child friendly material, flexible, easy to use and attractive.
- Selection of Play Equipment for the Final Assessment by the Research Scholar. Totally 11 play equipment were chosen for each age group of children (2-3, 3-4 and 4-5 years),

out of which each six play equipment designed specially for each age group, and five common play equipment for all age groups.

- The play equipment chosen for 2-3 year old children were musical wall, ball pit area, ball maze wall, colour wheel , 1 piece puzzle and sand pit
- The play equipment chosen for 3-4 year old children were colour organizer, self-adjustable ball tracker, tracing wall, lacing beads, 5-10 pieces puzzle and pulley
- The play equipment chosen for 4-5 year old children were climbing wall (7 feet height), magnetic puzzle bead maze wall, memory card play, count and match wheel, puzzle wall(40 pieces), and water play .
- The five play equipment chosen in common for all age groups were scribbling board, interactive wall, pretend play mat (6 different theme), basketball, and writing mat.

- All the developed prototype play equipment were designed using Auto CAD and 3ds Max by considering the various factors and standards given by IAP Action Plan (2020-2021), WHO (2020) and Government of India, Ministry of Women & Child Development (2018).

- Among the selected six play equipment for 2-3 year old children, 1 piece puzzle (CVI 0.85), musical wall (CVI 0.769), ball pit area (CVI 0.85), ball maze wall (CVI 0.879) and Colour wheel (CVI 0.786) were accepted by the experts but the sand pit area (CVI -0.289) was not accepted.
- Among the six play equipment selected for 3-4 year old children, jigsaw puzzle 5-10 pieces (CVI 0.866), colour organizer (CVI 0.977), ball maze wall (CVI 0.95), tracing wall (CVI 0.745) and lacing bead (CVI 0.963) were accepted by the experts. However, the pulley (CVI -0.289) was not accepted.
- Among the selected six play equipment for 4-5 year old children, 40 pieces jigsaw puzzle (CVI 0.938), climbing wall (CVI 0.0.759), maths counting wheel (CVI 0.874), magnetic bead maze wall (CVI 0.884) and memory play (CVI 0.943) were accepted by the experts, but the water play (CVI -0.648) was not accepted.
- Among the common five play equipment for all three age groups, scribbling board (CVI 0.855), basketball (CVI 0.919) and interactive wall (CVI 0.806) were accepted by the experts. All the developed six interactive pretend play mats were strongly agreed by the experts with high CVI values. However, the writing mat (CVI -0.208) was not accepted.

Finally 9 play equipment were selected for the Proposed Interactive Residential Play Space for each age group of children after 30 experts' assessment.

- Five play equipment chosen for 2-3 year old children were musical wall, ball pit area, ball maze wall, colour wheel and 1 piece puzzle
- Five play equipment chosen for 3-4 year old children were colour organizer, self-adjustable ball tracker, tracing wall, lacing beads and 5-10 pieces puzzle
- Five play equipment chosen for 4-5 year old children were climbing wall (7 feet height), magnetic puzzle bead maze wall, memory card play, count and match wheel and puzzle wall(40 pieces)
- Four common play equipment chosen for all age groups were scribbling board, interactive wall, pretend play mat (6 different theme) and basketball.

E. Parental Acceptance for Developed Interactive Residential Play Space

An awareness programme on the newly developed Interactive Residential Play Space was conducted at the research scholar's residence where the three Interactive Residential Play Space for three age groups (2-3, 3-4 and 4–5 year olds) were installed in three different rooms. Fifty parents (50 fathers and 50 mothers) of respective age group were requested to attend the awareness generation programme on the importance of having Interactive Residential Play Space in their respective residence.

- The mean value of parental awareness on the effect of smart gadgets on children before and after the awareness programme was 28.62 and 63.50 respectively with a t-value of 52.359. The parental awareness on the effect of smart gadgets on children have improved with 1per cent level of significance after awareness generation programme.
- After the awareness generation programme all the parents were aware of the importance of physical play with an increase of mean value of 89.24 from 54.76 (before awareness programme). The parental awareness on the effect of physical play on children have improved with 1per cent of significance level after awareness generation programme.
- The mean value of parental awareness on the effect of indoor play space on children before the programme was 75.96 and after awareness was 91.14 with a T-Value of 17.463. The statistical analysis proves that the positive increase in the awareness percentage of parents after awareness programme is highly commendable.

- Out of 50 parents, 96 per cent of the parents accepted the developed Interactive Residential Play Space. They stated that it will be beneficial for their children, and they felt that the developed design will save their children from the ill effects of using smart gadgets and also helps to strengthen their physic and language skills. Thirty-four per cent of the parents even accepted to fabricate the interactive play space in their residences.

F. Selective Interactive Play Space Designs Installed in the Chosen Households

After the awareness generation programme, 17 parents (34 per cent) accepted to install the Interactive Residential Play Space in their Residences. Out of these 17 households, only six households (35 per cent) were willing to install immediately and remaining 11 households (64.7 per cent) accepted the developed design, but due to financial constraints they preferred to install after one year. Thus, the research scholar selected only the six households who were willing to install at present. The bed room was selected to install the selective interactive play space designs. The dimensions of room, door, window and ceiling were analysed by the investigator.

After analysing the dimensions of the room a 3D view was developed for each design in each residence considering selected proper room dimensions using 3ds Max software. One play space for a boy in one residence and one play space for a girl in another residence for each age group such as 2-3, 3-4 and 4-5 year old were designed separately. Thus, one residence has one room designed either for a girl or for a boy for each age group. There is no separate play equipment designed based on gender, but it was designed based on age group, and the placement of play equipment their vary from residence to residence due to the space availability of the rooms. The developed design was then rendered with the help of V-Ray plugin software. The rendered image was shown to the family members to get design approval.

After getting approval from the family members, the 2D view was developed for each residence with the Auto CAD software for the reference to the research scholar and carpenter. The 2D drawing included the elevation of the four walls of each six room with dimensions. With the help of 3D and 2D views, the prefabricated play equipment was installed in the selected six residences at an appropriate height as given in the drawing. The installation was done with the help of the carpenter. The cost of developing the interactive residential play space was Rs 15,772 for 2-3, Rs 16,480 for 3-4 and Rs 17,875 for 4-5 year old children.

G. Documenting Six Case Studies on Impact of Interactive Residential Play Space on Children

The Developed Interactive Play space was installed in six households. The effect on the use of Interactive Residential Play Space was analysed with the help of the parents and caretakers' support. The comparative analysis of time spent by children on smart gadgets and Interactive Residential Play Space revealed that , it was very positive to note that all the selected six children spent maximum time on smart gadgets during the first week (8hs 54 min in Case-B and 4hr 10min in Case-C) and there was a gradual reduction in every week, and it was minimum (1hr 32 min by Case-E and 2hrs 2 min by case-B and D) at the end of the ninth week. The impact was due to their involvement and interest shown in playing in the Interactive Residential Play Space and it is proved that the time spent on Interactive Residential Play Space was minimum (16min by Case-B and 1hr 26 min by Case-D) in the first week and gradually increased every week and at the ninth week the time spent on it was maximum (7hr12min in Case-A and 5hrs53 min in Case-F) by all children.

V. Conclusion

It may be concluded from the research study that children are using smart gadgets for long period of time resulting in negative impacts on their health and lifestyle. After installing the interactive play space in their residences, the time they spent on the smart gadgets significantly reduced. The parents claimed that an Interactive Residential Play Space acts as a great alternative to smart gadgets. The cost of developing the interactive residential play space was Rs 15,772 for 2-3 year old children, Rs 16,480 for 3-4 year old children and Rs 17,875 for 4-5 year old children. The fabrication cost of each of the equipment can be further reduced if they are fabricated in large numbers of 1000 and more. Thus Interactive Residential Play Space is a big boon for every household in saving time, energy and money.

VI. References

- Bobick, A. F., Intille, S. S., Davis, J. W., Baird, F., Pinhanez, C. S., Campbell, L. W and Wilson, A. (1999). The KidsRoom: A Perceptually-Based Interactive and Immersive Story Environment. Presence, 8(4), 369-393.
- Caterpillar Lane Playground (2017): https://www.harbourside.com.au
- Children's Discovery Museum (2001): Seetue, P. (2009). An Investigation of Visitor's Satisfaction Based on Service Quality Dimensions at the National Discovery Museum Institute: A Case Study of the Museum of Siam, Bangkok, Thailand.

- Dhirar, N., Dudeja, S., Khandekar, J and Bachani, D. (2018). Childhood Morbidity and Mortality in India—Analysis of National Family Health Survey 4 (NFHS-4) Findings. Indian Pediatrics, 55, 335-338.
- Feng, S. (2022). The Detrimental Effects of Mobile Game Addiction on Chinese Primary School Students and Possible Interventions. Science Insights Education Frontiers, 13(2), 1911-1922.
- Fong, M. M. J and Peralta, M. (2018). Infant and Toddler Development from Conception to Age 3: What Babies Ask of Us. Teachers College Press.
- Gelsomini, M., Cosentino, G., Spitale, M., Gianotti, M., Fisicaro, D., Leonardi, G and Bordegoni, M. (2019). Magika, a Multisensory Environment for Play, Education and Inclusion, in Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems, 1-6.
  https://link.gale.com/apps/doc/A755332508/AONE?u=anon~a194a183&sid=googleScholar&xid=27e3b6e0
  https://ncpcr.gov.in/uploads/165650458362bc410794e02_effect1.PDF
- Kaboom. (2019): Gibson, C. (2023). The Future is a Playground. Washington Post, NA.
- Lea, D., and Bradbery, J. (2022). Oxford Advanced Learner's Dictionary 10th Edition, Oxford Publication, 200.
- National Commission for Protection of Child Rights (2023): Effects (Physical, Behavioural and Psycho-social) of Using Mobile Phones and Other Devices with Internet Accessibility by Children, A Study by the National Commission for Protection of Child Rights (NCPCR) Administered by: Rambhau Mhalgi Prabodhini (RMP).
- Pollarolo, E., Storksen, I., Skarstein, T. H and Kucirkova, N. (2023). Children's Critical Thinking Skills: Perceptions of Norwegian Early Childhood Educators. European Early Childhood Education Research Journal, 31(2), 259-271.
- Shirai, A., Hasegawa, S., Koike, Y and SATO, M. (2002). "Penguin Hockey": A Tangible Playroom for Children.The Journal of the Society for Art and Science, 1(3), 117-124.
- Stellar Children's Museum (2012):https://www.stellarchildrensmuseum.com/gallery.html
- Wolf, C. E. (2013). Jungle Gym Playroom: Program Development Plan. The University of Toledo, 120. 2013.